

MSC Guidelines for Commercial Fishing Vessel Stability

Procedure Number: H2-20

Revision Date: 03/21/2013

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Purpose: To provide guidance on the review of commercial fishing vessel (CFV) stability.

References:

- a. 46 CFR Subchapter C – Uninspected Vessels
- b. 46 CFR Subchapter E – Load Lines
- c. Marine Safety Manual Chapter IV Section 6
- d. Guidance for the Alternate Compliance and Safety Agreement (ACSA) Program, Revision 7, December 2012
- e. ABS Rules for Building and Classing Steel Vessels Under 90 meters (295 feet) in length 2011, Part 5 Specialized Vessels and Services, Chapter 14 Fishing Vessels
- f. Navigation and Vessel Inspection Circular (NVIC) 5-86 “Voluntary Standards for U.S. Uninspected Commercial Fishing Vessels”
- g. MTN 04-03, Change 1 “Authorized Class Societies Technical Support and Oversight”
- h. International Code on Intact Stability, 2008, Chapter 2.1 Fishing Vessels including; IMO International Conference on Safety of Fishing Vessels 1977 and 1993 amendments
- i. MTN 04-95 “Lightship Change Determination”
- j. MSC Plan Review Guidelines H2-01, “Submission of Stability Test Procedures”
- k. MSC Plan Review Guidelines GEN-02, “Submission of Stability Test (Deadweight Survey or Inclining Experiment) Results”
- l. MSC Plan Review Guidelines H2-06, “Trim and Stability Books”
- m. NVIC 3-89 “Guidelines for the Presentation of Stability Information for Operating Personnel”

Contact Information: If you have any questions or comments concerning this document, please contact the Marine Safety Center (MSC) by email or phone. Please refer to the Procedure Number H2-20.

Email: MSC@uscg.mil

Phone: 202-475-3401

Website: <http://homeport.uscg.mil/msc>

Responsibilities: Using applicable portions of references (a) through (m), the submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements. The submission shall be made electronically to the

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above email address or, if paper, in triplicate to the MSC's address found on the above website. To facilitate plan review, all plans and information specified in these guidelines should be submitted as one complete package through a single point of contact for the project.

General:

The MSC reviews CFV stability for load line assignment at the request of an Officer in Charge, Marine Inspection (OCMI), for a vessel of concern, or as part of our oversight of an Authorized Classification Society (ACS). The guidance in this document applies to both new and existing vessels.

Applicable Regulations:

References (a) through (d) provide specific guidance on the applicable stability criteria and definitions. The following guidance summarizes the applicability found in these references:

- ❑ **Vessels under 79 feet Registered Length:** There are currently no regulations governing the stability for a vessel of this size.
- ❑ **Vessels over 79 feet Registered Length, not required to be load lined:**
 - a) *New vessels built after September 15, 1991 and those vessels determined to have undergone a Major Conversion or been substantially altered on or after September 15, 1991:* These vessels will be subject to all of 46 CFR Subchapter C Subpart E. 46 CFR 28.580 does not apply to those that have undergone a Major Conversion or been substantially altered.
 - b) *Existing vessels built before September 15, 1991 (i.e. grandfathered vessels):* These vessels will be subject to the alternate safety compliance and alternate load line compliance programs once established. Currently, the ACSA program requires such vessels to meet 46 CFR Subchapter C, Subpart E. 46 CFR Subchapter C, Subpart E should be applied as completely as reasonable (excluding 46 CFR 28.580).

NOTE: For all fishing vessel stability reviews for non-load lined vessels conducted by the MSC, vessel stability will be evaluated using 46 CFR Subchapter C, Subpart E and good marine practice. All existing vessels will be subject to the alternate safety compliance and alternate load line compliance programs once established. Currently, the ACSA program requires vessels to meet 46 CFR 28.500. MSC will continue to provide technical comments and / or concerns in writing to the OCMI upon their request, as the OCMI is the approving authority for ACSA fishing vessel stability.

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❑ **Vessels over 79 feet Registered Length, required to be load lined:**

- a) *46 CFR 42.09-1, Assignment of Loadlines*: "The assignment of loadline is conditioned upon the structural efficiency and satisfactory stability of the vessel." The MSM, Volume IV, Section 6.E.19 provides two alternatives for stability criteria:

- (1) 46 CFR Subchapter S; and
- (2) NVIC 5-86.

NOTE: The MSM has not been updated since September 1990. 46 CFR Subchapter C, Subpart E was not promulgated until August 14, 1991. . The stability criteria and assumptions provided in 46 CFR Subchapter C, Subpart E are appropriate for processing vessels which may also be engaged in the catching, taking, or harvesting of fish. Stability criteria and assumptions provided in 46 CFR Subchapter S are only appropriate for vessels used exclusively for processing fish and other living resources.

- b) *Fishing vessels (fishing, fish processing and tendering) required to be classed*: The stability review will be conducted in support of load line using 46 CFR Subchapter C, Subpart E, the applicable classification society rules, and good marine practice. 46 CFR Subchapter E states that a satisfactory stability standard is to be met, of which 46 CFR Subchapter C, Subpart E is currently the most appropriate for these vessels.

Fish processing vessels built or converted after July 27, 1990: 46 CFR 28.720(b)(2) requires that each fish processing vessel built or converted after July 27, 1990 meet the survey and classification requirements of an ACS. Therefore all stability requirements outlined in the ACS rules will also be applied. The MSC conducts oversight on all load line stability matters completed by an ACS.

- c) *Fishing vessels (fishing, fish processing and tendering) **not** required to be classed*: The stability review will be conducted in support of load line using 46 CFR Subchapter C, Subpart E, the applicable classification rules, and good marine practice. The current ACSA program requires these vessels to meet 46 CFR Subchapter C, Subpart E. All existing vessels will be subject to the alternate safety compliance and alternate load line compliance programs once established. As indicated above, the MSC conducts the oversight on all load line stability that is completed by the ACS.

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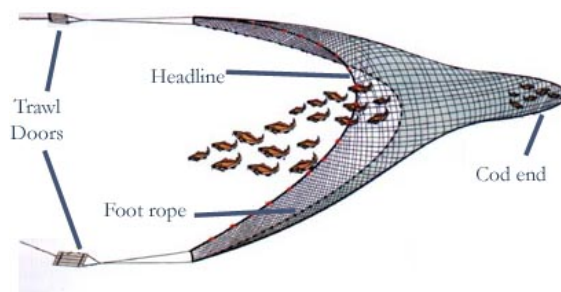
NOTE: Please note that for the statement “required to be classed”, the requirement for classification can come from the US Code or the requirements specified by the ACS. DNV has confirmed that they require their load lined vessels to be classed.

Definitions

- ❑ Alternate Compliance and Safety Agreement (ACSA) Program: Voluntary program by which fish processing vessels, that are not accepted for classification and /or loadline by an ACS, can demonstrate an equivalent level of safety per the intent of 46 CFR 28.720. This program is currently managed by Sector Puget Sound.

Note: This program is currently only applicable to those fish processing vessels under the jurisdiction of Sector Anchorage and Sector Puget Sound.

- ❑ Alternate Load Line Compliance Program (ALLCP): In accordance with 46 United States Code (USC) 5103(c), an alternative safety compliance program to be developed in cooperation with industry and may be developed for specific regions.
- ❑ Alternate Safety Compliance Program (ASCP): In accordance with 46 USC 4503 (2) and (3), an alternative safety compliance program to be developed in cooperation with industry and may be developed for specific regions.
- ❑ Cod End: The trailing end of the net where fish are finally "caught". The size of mesh in the cod end is a determinant of the size of fish which the net catches. Consequently, regulation of mesh size is a common way of managing mortality of juvenile fishes in trawl nets.



- ❑ Fish: Finfish, mollusks, crustaceans, and all other forms of marine animal and plant life, except marine mammals.
- ❑ Fish Bin: Large space, usually located adjacent to the factory on fish processing vessels, where the fish is stored to await processing.
- ❑ Fish Oil: Fish oil is a bi-product of the cleaning and freezing of the catch produced during fish processing operations. Many vessels are undergoing changes to enable them to carry fish oil.

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- ❑ Fish Processing Vessel: A vessel that commercially prepares fish or fish products other than by gutting, decapitating, gilling, skinning, shucking, icing, freezing or brine chilling.
 - ❑ Fish Tender Vessel: A vessel that commercially supplies, stores, refrigerates, or transports fish, fish products, or materials directly related to fishing or the preparation of fish to or from a fishing, fish processing or fish tender vessel or a fish processing facility.
 - ❑ Fishing Vessel: A vessel that commercially engages in the catching, taking or harvesting of fish or an activity that can reasonably be expected to result in the catching, taking or harvesting of fish.
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Submittal Items:

Provide the following plans and calculations:

- ❑ General Arrangements including deck plans, hold plans (indicating compartmentation and watertight doors), inboard and outboard profiles (indicating potential downflooding points such as vents or windows)
 - ❑ Lines or offsets
 - ❑ Computer hull model (optional, however it will expedite stability reviews)
 - ❑ Tank capacity tables/plan with free surface data
 - ❑ Draft mark locations, longitudinal and vertical reference points
 - ❑ Copy of the signed stability test notes (signed by ACS surveyor or USCG inspector)
 - ❑ Stability test/lightship results
 - ❑ Intact stability calculations to include:
 - a) List of downflooding points and hull openings
 - b) Crane information including capacity, location and supporting calculations (if applicable)
 - c) Ice load calculations (if applicable)
 - d) Water on deck calculations (if applicable)
 - e) Fishing gear loads (as needed)
 - f) Other calculations as needed to support assumptions and loads used in calculations
 - ❑ Subdivision and damage stability calculations (if applicable)
 - ❑ Trim and Stability Booklet (if applicable)
 - ❑ Load Line Survey Report (LL-11D) (if applicable)
 - ❑ ACSA Stability Addendum (if applicable)
 - ❑ Additional plans and calculations as needed (i.e. structural plans and calculations to demonstrate compliance with buoyant superstructure requirements)
 - ❑ List of changes made to the vessel that will impact stability
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Stability Tests

- ❑ When trying to determine if a stability test is required, the guidance of reference (i) should be followed.
 - a) As a condition of enrollment in ACSA, CFVs are required to undergo a stability test every five years. The final decision pertaining to the type of test that is required will be at the discretion of the cognizant OCMI.
 - b) There is currently no direct guidance provided on how and when stability tests are required for fishing vessels that are classed and / or load lined by an ACS. Therefore, until further guidance is provided, reference (i) should be followed.
- ❑ When preparing CFV stability test procedures and results:
 - a) Stability test procedures should be prepared in accordance with reference (j), and should be submitted to MSC at least two weeks prior to the test date for approval, when applicable.
 - b) Stability test results should be prepared in accordance with reference (k).
 - c) Due to the arrangement of larger fishing vessels it may be difficult to minimize trim to the limits per reference (k). MSC may make some allowance for this by allowing additional slack tanks beyond what is permitted by reference (j) if sufficient justification is provided in the stability test procedure.
 - d) The vessel should be properly prepared at the time of the stability test, the weights to add and subtract should not exceed 2%. In order for items to be excluded from the 2% weights to add or subtract at the time of the stability test they must generally be fixed (i.e. welded or bolted to a dedicated foundation) and the exact weight and center of gravity must be known through measurement or manufactures specification. In the case where there are a large number of identical items a representative sample of the items may be weighted and excluded as accepted by the MSC on a case by case basis. Structural members, angles, and brackets are not permitted to be excluded from the weights to add or subtract.
 - e) Fishing equipment, including netting and gear, are not to be considered as part of lightship and should be accounted for in the weights to add, remove, or relocate per reference (k), if they are onboard at the time of the test. Every attempt should be made to remove as much of the fishing equipment as possible. In the event of perceived uncertainty of the weight of the fishing equipment, netting, gear, etc., the attending marine inspector or surveyor may require such items to be removed from the vessel prior to conducting the stability test.

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- f) The transverse center of gravity (TCG) of all items should be properly accounted for when establishing vessel lightship characteristics if the resultant lightship list is more than 0.5 degrees.
 - g) For load lined vessels the information should be provided in accordance with 46 CFR 42.09-10(c).
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Stability Calculations

Commercial fishing vessel stability calculations should be developed with specific focus on the unique characteristics of fishing operations. In the preparation of stability calculations certain assumptions and decisions regarding loads, free surface effects, and other items are made. The precision of these assumptions directly impacts the outcome of the stability analysis.

The following should be considered in the preparation of stability calculations to ensure that the full range of possibilities have been accounted for and result in accurate and / or conservative results:

- ❑ **Hull Model:** If a hull model is provided, sufficient information should be presented to enable verification of the model. In many cases fishing vessels have undergone extensive changes; sponsoning, addition of structure to the deck house, etc. Due to the age and extent of changes to CFVs an up-to-date accurate lines plan and list of hull openings is not always available. However, every effort should be made to ensure that the model used in the analysis of stability is as complete and accurate as possible.
- ❑ **Effective Deckhouse Structure:** Buoyant volume of the deckhouse for intact stability should be properly considered in accordance with section 6.B.1 of reference (c). Guidance on buoyant superstructure for unintentional flooding is provided in 46 CFR 28.580 (h).
- ❑ **Deck Loads:** When applying reference (e) to ensure proper strength of a deck that will be loaded with large temporary deck loads such as catch and / or cod ends, the “h” applied is not to be less than the appropriate vessel length equation, and should be taken as the anticipated pressure “p” divided by 45 lbf/ft³. We recommend that the identified head be multiplied by a factor of 1.1 to account for any shifting / uneven loading, green loads and / or other accelerations of the vessel in the seaway.
- ❑ **Operational Loads:** Many CFVs have nets and other fishing gear that is used based on the season and fishery. The stability analysis should identify the range of these loads and / or any assumptions made relative to these items.
- ❑ **Loading Conditions:** As there are large loads that are moved around a fishing vessel during fishing and processing operations, it is important to identify the

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full range and combination of loads that a vessel will experience. If the vessel has a lightship list of more than 0.5 degrees then all of the loading conditions must properly account for the vessel's TCG. Fuel and other consumable tanks may not be used to correct vessel list per section 6.E.19.C of reference (c). Ballast tanks may be used to adjust vessel list. Often times the most critical loading condition for the vessel will result when the vessel is low on fuel and low on catch, or as the vessel is beginning to fish but has little or no catch in the hold. Minimally, the following loading conditions should be addressed:

- a) Departure condition from port with full fuel, water, stores, ice, fishing gear, etc.;
 - b) Arrival at the fishing grounds with reduced fuel, water, and stores and no catch (the amount of fuel, water and stores should be based on the distance to the fishing area);
 - c) At the fishing grounds with reduced fuel, water and stores and 50% catch;
 - d) Departure from the fishing grounds with reduced fuel, water, and stores and full catch;
 - e) Arrival at home port with 10 percent fuel, water and stores, and full catch (be sure to account for any weights to be lifted or suspended and their effects on stability in a turn);
 - f) Arrival at home port with 10 percent fuel, water, and stores and 20 percent of full catch.(40 percent of full catch will be considered if catch records are provided demonstrating that the vessel always returns to port with at least 40 percent catch.)
- ❑ Cargo: For a vessel with large cargo holds a full range of hold loading options should be considered. Also for vessels that produce fish oil, please note that fish oil is considered a hazardous material so a fishing vessel cannot carry more than 20% of their cargo deadweight in fish oil per 46 CFR Subchapter D.
 - ❑ Vessel List: For a vessel with a list of more than 0.5 degrees in the lightship condition, the actual vessel TCG should be properly accounted for in all conditions of loading.
 - ❑ Ice Loads: For vessels operating in applicable regions, ice loads should be calculated in accordance with 46 CFR 28.550. Ice loads should be considered in all conditions of loading.
 - ❑ Free Surface: The virtual rise in the vessel's vertical center of gravity (VCG), due to liquids in tanks, should be accounted for in accordance with 46 CFR 28.540, or 46 CFR 42.20-11. The free surface of all non-consumables, including fish bins and cargo holds, should be properly addressed per 46

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CFR 28.540(a)(2). If ballast tanks are filled while the vessel is underway, the maximum free surface of the tanks should be considered.

- ❑ **Watertight and Weathertight Integrity and Downflooding:** These items should be properly addressed in accordance with 46 CFR 28.560 and 28.510, or 46 CFR 42.09-25, 42.13-15(l) and 42.15. There are several variations on the definition of downflooding and downflooding angle across the various references. Typically, any point that cannot be closed weathertight is to be considered as a downflooding point for stability calculations. However, for fishing vessels there are often large openings in the hull that are left open for long periods of time while fishing operations are underway. All openings that are typically open during fishing operations may need to be considered as downflooding points. All openings into the fish holds and processing spaces that are normally open while fishing should be checked to ensure that unintentional flooding could not occur at an angle of heel of 20 degrees. Final determination as to which points should be considered for downflooding is at the determination of the submitting engineer based upon the use of good engineering judgment and marine practice. Things to be considered include the ability of the opening to be rapidly closed weathertight and / or watertight, whether the related hatches are continually manned, etc.
- ❑ **Water on Deck:** When applicable water on deck should be considered as described in 46 CFR 28.565.
- ❑ **Extents of Damage:** When applicable, the extent of damage should be assumed as described in 46 CFR 28.580(d), or 46 CFR 42.20-11, and 42.20-12. Note that the extents of damage requirements are different than those provided in 46 CFR Subchapter S.
- ❑ **Permeabilities:** The permeability of compartments should be properly accounted for when damage stability calculations are performed per 46 CFR 28.580(g). For intact stability calculations special attention should be paid to the permeabilities of fish holds as this will vary based on the type of catch and how the catch is stored. For example, on a fishing vessel the fish are often stored in holds that are flooded with water, while on fish processing vessels the catch is often boxed and frozen.
- ❑ **Lifting Weights:** Many fishing vessels have cranes or other lifting gear installed. These loads should be accounted for in accordance with 46 CFR 28.545. Detailed information on the type, size, location and operating limits of all lifting equipment should be provided along with any calculations used when evaluating vessel stability.
- ❑ **Freeboard:** It is not acceptable for a CFV to operate with negative freeboard. Specifically the vessel's freeboard deck should not be submerged. If a vessel

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wishes to re-designate a higher deck as a new freeboard deck, then the structure below the new freeboard deck must be shown to comply with the hull structural requirements, as well as meet the applicable watertight and watertight closure requirements. Additionally, vessels required to be load lined will be evaluated against the requirements of reference (b).

- ❑ Trawling loads: For vessels that trawl over the side, the applicable sections of references (a) (46 CFR 28.545) and part F of reference (f) should be applied. For vessels that conduct stern trawling operations the criteria of 46 CFR 173.095 should be applied. The definition of downflooding points and angles required per 173.095 (e) may be reconsidered for vessels on a case by case basis.
 - ❑ Ballast: If the vessel has a heel in the lightship condition we encourage the owner / operator to install permanent ballast to correct the list. Alternatively ballast tanks may be used to adjust / correct for the vessels list. Fuel or other consumable tanks may not be used to correct vessel list per MSM IV, 6.E.19.
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Stability Instructions

There are many details that can be included in CFV stability instructions to ensure that the master has sufficient information to be able to rapidly and precisely estimate that loads and locations of the various items on the vessel. The following items should be considered:

- ❑ CFV stability instructions should be prepared in accordance with reference (l) based on the specific type of vessel.
- ❑ If a vessel has a significant lightship list the instructions should include sufficient information to ensure that the master understands the magnitude of asymmetric ballast that is necessary to adjust the list and ensure the vessel is operated at an even heel.
- ❑ If a vessel's cargo must be loaded in a specific manner in order for the vessel to operate within a safe stability operating range this should be clearly defined.
- ❑ If the stability instructions contain more than one method for verifying that the vessel is operating in a safe stability condition, it should be clear when the various methods apply.
- ❑ Asymmetric Consumable Tank Loading: Consumable tanks may not be asymmetrically loaded to offset vessel list or operational deck loads (including pot loads) when simplified stability instructions are being developed. Per reference (m) only a single pair of consumable tanks is to be partially filled at a time for simplified stability instructions. If the owner wishes to have asymmetrically loaded tanks then a detailed trim and stability booklet that enables the actual vessel loading condition to be evaluated against the appropriate criteria should be used.

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Disclaimer:

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the Marine Safety Center (MSC), the unit responsible for implementing this guidance.